U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Electronics and Instrumentation Engineering **Duration: 3 hrs.**
Course Code: 19EI6PCAPC **Max Marks: 100**
Course: Automation in Process Control **Date: 15.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

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Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) Enumerate the benefits of automating a plant **05**

b) Suggest an appropriate block diagram to acquire data from the field layer and communicate to the control layer in an automation pyramid. **05**

c) Suggest a suitable logic to interface various discrete input/output devices to PLC with appropriate diagrams. **05**

d) It's a known fact that a ladder diagram consists of several rungs. How the ladder program is executed internally. Discuss the stages involved during each cycle with diagram **05**

UNIT - II

2 a) Develop a ladder program for the following application shown in Fig 2(a) using appropriate logic as per IEC 61131.3 standards. Summarize the sequence of operation. **09**

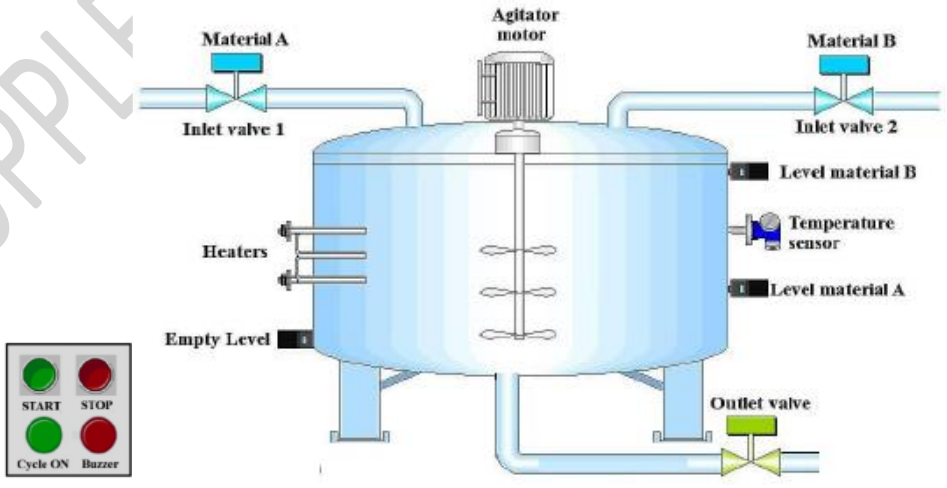

Fig 2(a)

b) Explain the operation of seal in circuit using suitable diagram. **04**

c) Develop a ladder program as per IEC 61131.3 standards to simulate the parking garage as depicted in Fig 2(c) and summarize the sequence of operation. **07**

Fig 2(c)

UNIT - III

3 a) A timing chart for vehicle movement suggested by an expert committee is shown in Fig 3(a). A traffic signal needs to be installed for vehicles moving from North to South and East to West at Bhairon Marg (busy location in Delhi). Analyze the requirement and develop a ladder diagram to implement the same using SQO instruction as per IEC standards to suit all possible cases. Summarize the operation of the logic being proposed. **10**

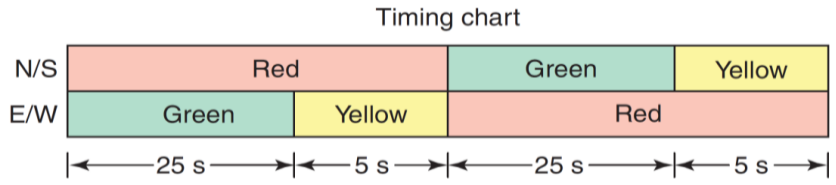

Fig. 3(a)

b) A sequential process plant requires to control multiple DC motors with a delay of 0,5,10,15 second intervals. Suggest a suitable logic as per IEC 61131.3 standards to simulate the process using a single timer and GEQ instruction. Summarize the sequence of operation. **10**

UNIT - IV

4 a) Guiness Brewery located at Ireland is one of the most successful beer brands worldwide. It is a large-scale manufacturing/process plant comprising of control loops that needs to be monitored and controlled. Suggest a suitable DCS architecture and justify the same. **07**

b) Discuss the various design considerations that is expected from a modern DCS **08**

c) Enumerate the advantages of DCS **05**

OR

5 a) "Overall Safety Life Cycle (SLS) (IEC 61508-1 standards) is associated with safety during the entire lifecycle of the equipment, from the concept phase to the decommissioning phase" Substantiate with suitable diagram. **10**

b) Coca-Cola Company believes that their long-term success depends on working to ensure the safety of their workers, visitors to their operations, and the public. The company considers that a safe and healthy workplace is a fundamental right of every person and a business imperative. Suggest a **10**

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suitable Layer of Protection Analysis (LOPA) that can be used to identify the need for Safety Instrumented Systems (SIS) or other protection layers to improve process safety.

UNIT - V

6	a)	Saudi Aramco - Saudi Arabia's national oil company is the most profitable oil company in the world. It is operating in both upstream and downstream segments and has extensive operations in production, exploration, petrochemicals, refining, marketing and international shipping. It is required to monitor well and pumping sites, distribution of pumping pressure, pipeline flow and control of compressor stations. Also, from a safety point of view it is necessary to detect anomalies and prevent catastrophic events from occurring. Suggest a suitable SCADA structure (generalized) with various components and justify the same.	**10**
	b)	Describe Monolithic SCADA Systems.	**05**
	c)	Enumerate the core functionalities of SCADA	**05**

OR

7	a)	Discuss the six principles used for improving the quality of HMI	**10**
	b)	"An automation system is broadly divided into three subsystems: instrumentation, control, and human interface". Substantiate the statement with a neat structural diagram for each of the component.	**10**

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